GREATER LAS VEGAS ORCHID SOCIETY

SUNDAY, NOVEMBER 7, 2004 2PM

THE SEPTEMBER MEETING WILL BE HELD IN THE USUAL PLACE, THE NEVADA GARDEN CLUB BUILDING AT WASHINGTON AND TWIN LAKES ON THE WESTERN EDGE OF LORENZI PARK. THE BUILDING WILL BE OPEN AT 1PM.

Carol Siegel, Newsletter Editor

CAROL SIEGEL- PRESIDENT
CLARICE DEAN -VICE-PRESIDENT
EILEEN MCKYTON- SECRETARY
DIANA SMITH- TREASURER

AND...

Dan Mumau, Michael Lawless, Marsha Hawley - Membership Hospitality Chairmen
Eileen McKyton and Dan Hawley- Welcome Desk
Lillian Patterson- Photographer and Historian
Dan Mumau and Tony Billitere- Raffle Chairmen
Phyllis Bond, Leslie Doyle, Shelly North and Eileen McKyton- Special Events Chairmen
Jeri Lee and Tony Billitere- Community Liaison
Alex McKyton -Building Chairmen and Webmaster
Tex Severance and Mike Levin- Show and Tell Gurus
Tex and Gidget Severance- Judging Chairmen
Scotty Nogaim- Election Chairman, Raffle Lady
Steve Ninemire Library Chairman Clarice Dean, Assistant Librarian.
Clarice Dean- Trip Chairman
John Haydukavitch-Video Chief
Shelly North-Classy Club Apparel Chairlady

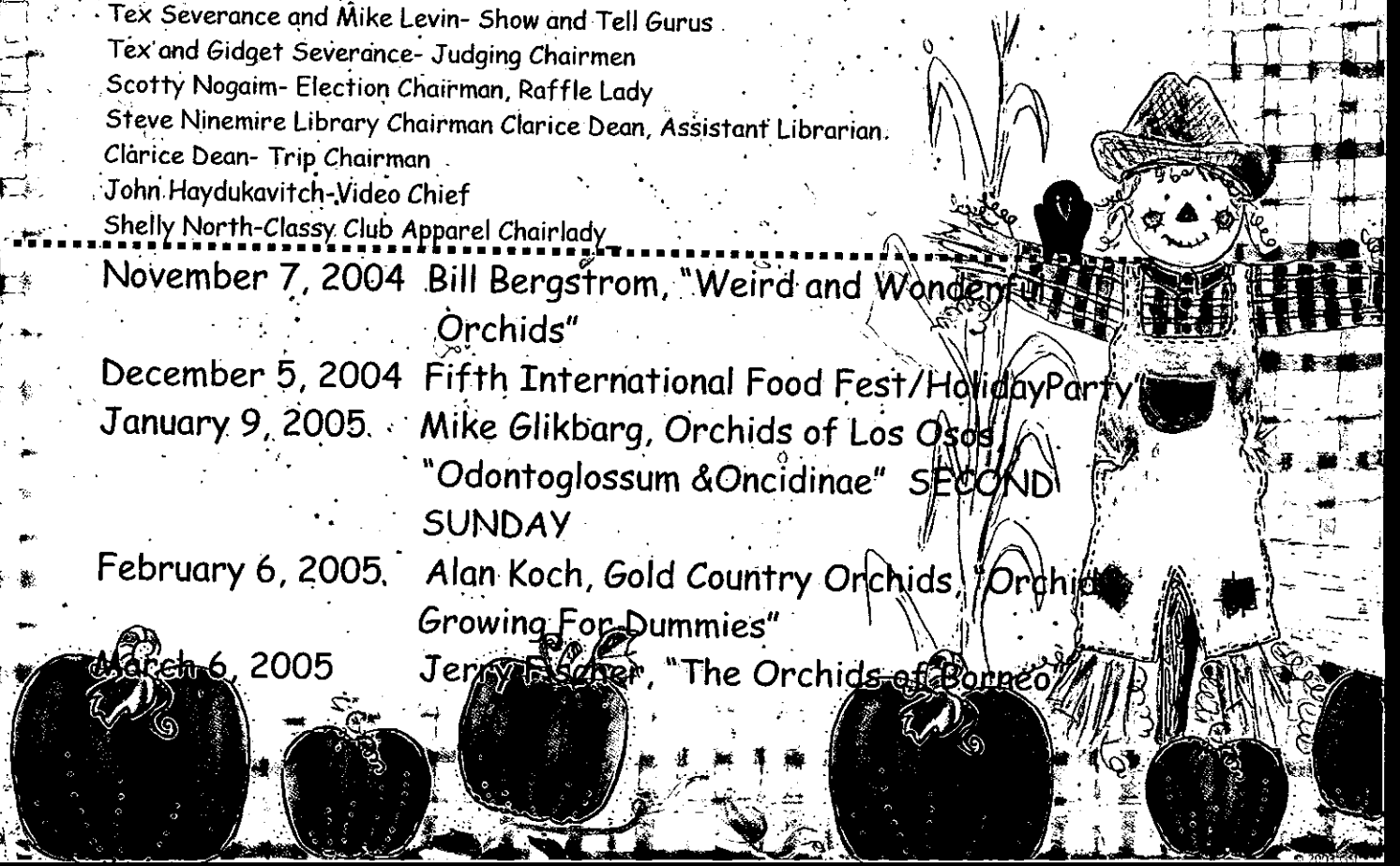
November 7, 2004 Bill Bergstrom, "Weird and Wonderful Orchids"

December 5, 2004 Fifth International Food Fest/HolidayParty

January 9, 2005 Mike Glikbarg, Orchids of Los Osos, "Odontoglossum &Oncidinae" SECOND SUNDAY

February 6, 2005 Alan Koch, Gold Country Orchids, "Orchids Growing For Dummies"

March 6, 2005 Jerry Fischer, "The Orchids of Borneo"



April 3, 2005	Charles Rowden, "Orchid Photography"
May 1, 2005	Dr. Joseph Arditti "Techniques Orchids Use to Survive in the Wild"
June 5, 2005	Sue Fordyce, owner Fordyce Orchids " "Sophronitis and Her Sisters"/"Orchid Sign Language"
July 10, 2005	SECOND SUNDAY Sheldon Takahashi, Carmela's Orchids, "Cattleyas"
August 7, 2005	Barbecue
September 11,2005	Virtual Greenhouse Tour
November 6, 2005	The Adventures of Dennis D'Allesandro in Bolivia"
December 4, 2005	Sixth Annual International Food Fest and Holiday Party

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Our club has PARTIES, not just meetings, and our October party was no exception. Shelley North, our artistic angel, distributed the aprons, hats, shirts and totes with our club logo. When Simply Hawaii went out of business, she also charmed them out of 100 orchids, which she donated to the raffle! Diana Smith was so impressed that she wore her beautiful apron the whole meeting! Marilyn Worthington, Esther Choi, Claudia Theriot, and Brooke Ingram provided delicious food, and we welcomed guests Robert Ryan, Gerda Dullaart, and Reed Merrell. Reed, by the way, is a former president of our orchid club. Glad to see you all! We missed John Nogaim who is recovering from gall bladder surgery. Get well soon, John. We wish a get well to Jean Gordon after her recent hospitalization. We love you.

Daniel Vong, a great friend of our club, sold so many gorgeous orchids that he had to keep running to his truck to replenish his sales tables. He also provided an outstanding raffle table for us, and we made $100 profit on it—in addition to being really happy campers! He has

agreed to provide the 100 raffle plants for our Holiday Party. Raffle tickets at the party are $6, and all members receive a blooming orchid worth $25 with the club subsidizing the rest of the purchase price, our gift to you. Thanks, Daniel!

Diana Smith and Carol Siegel donated Golden Goddess Herbal Moisturizer that they formulated and made themselves!! The club made $200 on this fun fundraiser. We will bring some more in since we know you will love the results. (Hope you won't look too young to get your senior discount at the movies. Bring your ID,just in case...)

Eileen McKyton sold cattleyas from Carmela's Orchids, and the gorgeous plants made over $150 profit for the club. We appreciate this generous effort by Eileen who is just recovering from surgery. Glad to see you back, Eileen. AND there were lots of other members participating. Tony Billitere sold Entertainment Books, and Mike Levin sold lovely phragmipedium, while Marsha and Dan Hawley served as friendly ambassadors to everyone entering the room.

Clarice Dean presented our Species of the Month, *Cycnoches chlorichilon* from Panama, Columbia and Venezuela. This gorgeous, yellowish/white fragrant flower has separate male and female flowers, with its swanlike male flowers sometimes reaching six inches in diameter.This is one of those deciduous orchids that lose leaves in the winter and need to be watered very little at that time. You might want to check out of Species of the Month Book, which has all the wild species dear Clarice has featured over the years. She did this—and vacuumed, too! What a gal...

Our Show and Tell Gurus Mike Levin and Tex Severance did a lively presentation of the many gorgeous blooming orchids including those by Dennis and Clarice Dean, Carol Siegel, Diana Smith, Jackie

Braverman and Jeannie Salles. If I forgot you, I am getting old, but we still thank you very much.

Our fabulous speaker was Aaron Hicks, the founder and operator of the Orchid Seed Bank. Check out his website at www.orchidseed.com, which will tell you all about his seed bank, how to send and receive seed. They try to foster conservation through the propagation of orchids. Recipients don't just get seed—they get information and advice. We thank Clarice for arranging this terrific speaker. Thanks to Mike Levin for donating his California hotel stay prize to the speaker for his free stay.

Next month, we will be holding elections once again. The current board is willing to run again for 2005 since we all had such a good time together, Carol Siegel for President, Clarice Dean for Vice-President, Eileen McKyton for Secretary, and Diana Smith for Treasurer. Other members, of course, are encouraged to run for those offices, too. Scotty Nogaim, our Election Chairlady, has been gracious enough to put together the slate. Call her at 363-3991 to nominate someone or put your own name down. We will, of course, take names from the floor in November, but it would be nice to be able to print up election forms if there will be a contest.

Next month, Eileen and Alex McKyton have arranged and are hosting the speaker. Bill Bergstrom, owner of Bergstrom Orchids, will be coming from Hawaii to speak about weird and wonderful orchids. You will remember that he spoke to us before and was really entertaining. He will be providing plants for sale and for the raffle table. If you would like to pre-order plants from him, you can check out his website at www.bergstromorchids.com . To find out if the plants are in bud or bloom, call him at 1-808-982-6047. He will bring the plants to the meeting, saving you the 20% or so that shipping usually amounts to.Thanks to Christina De La Cruz, Jean Gordon, Nita Bragg,

and Margaret Janes in advance for providing snacks and drinks for the meeting.

We thank Gail Harris, Terry Wilsey, and Jeri Lee who volunteered to represent our club at the Nevada Garden Club Fall Meeting on Saturday, October 23rd .Our club pays $4 for each member so all of you are members of the Nevada Garden Clubs, part of a national organization. It is this membership that lets us use this beautiful building each month for free and also now sponsors the Fall Garden Show.

The Fall Flower Show was held at the Gardens at the Springs Preserve as part of the Day with the Experts event put on by the Water Department. There was a huge turnout, and the huge air-conditioned tent that housed the flower show displays were a major attraction. We thank Tex and Gidget Severance for judging the show and Esther Choi and Phyllis Bond for serving as our clerks. Thanks to Terry Wilsey, Steven Ninemire, William Whaley and Diana Smith for manning our Experts table. Clarice Dean and Bill Whaley donated warm invitations to guests and informative culture sheets. Our orchid display was the highlight of the show, and we owe it all to the time and talents of Phyllis Bond, Diana Smith, Clarice Dean, Eileen McKyton, Carol Siegel and Shelly North. Way to go, gals and guys!

I am proud to report that my article on "Ten Types of Orchid Growers" was published this month (much to my surprise!) in the ORCHID DIGEST Cattleya Edition. The article appeared this summer in this newsletter.

Don't forget our annual Holiday Party will be at my home on Sunday, December 5 at 12:30 pm. I will provide a maragita machine, wine, drinks, paper goods, tiramasu, duck, roast pork, and two musicians who also sing! Please bring a dish for 10-12 people and a few canned

goods to give to the Salvation Army. We need generous souls to volunteer to bring a turkey, ham, or roast beef. At the end of the newsletter are two articles. The first is one I put together on watering our orchids. It includes some tips on watering orchids and also member feedback on how THEY water their orchids. I sent out an email query, and these kind folks shared their expertise and problems. It includes the special offer from US Filter to install de-ionized water tanks FREE, a savings of at least $100. Read about the offer. The second is a dynamite article on watering by judywhite, the single most interesting and educational orchid writer I have read from the American Orchid Society Bulletine, May 1990, p..483-394, copyright@ judywhite, all rights reserved, with permission of author granted in 2001. (I hope she remembers)

See ya at the meeting! Love, Carol 254-4168 growlove@cox.net

How to Grow Great Orchids With Awful Water

By Carol Siegel

The majority of orchids grow in the tropics. In case you haven't noticed, we don't live in the tropics. We don't even live NEAR the tropics. We live in the Mojave desert with its blazing hot summers, bone-dry air, and hard-as-a-rock water. There's no rain water dripping off the trees or cloud mist caressing our plants where we live. So we have to make do—and make better.

One of the biggest challenges to growing here is to provide the right water for our plants. Las Vegas water passes through mountains of limestone and gypsum picking up lots of calcium carbonate and calcium sulfate, which makes our water very alkaline. Orchids don't like all that calcium. The pH of our city water is 7.8, very alkaline, with a hardness (calcium carbonate) of 250 and dissolved solids (alkalinity) of 120. We want to get our water to a pH of around 6.0-6.5 (slightly acid) and to eliminate much of the calcium solids in our water.

What are our choices? We can, of course, use rain water, but in this parched drought that we are enduring, that won't help us at all. Some of us use tap water because we have no other choice, plain city water. If you do, at least flush the plant out every so often with bottled water or even more tap water to wash out the accumulated salt. Many of us have softened-water coming out of our taps, but that water has enough sodium in it to kill our orchids. We can put bags of potassium in our water softeners instead of sodium, and our orchids will be happier. Potassium is available at Home Depot and Costco. Potassium-softened water will still have a pH of 7.8, but the addition of fertilizer, will bring it to a nice 6.2. That is one choice. I used the potassium-softened water for years, and my orchids, although not great, did okay.

We can use Sparkletts or distilled water from a bottle, which has no solids and a great pH, but it is really expensive for anything less than just a few plants. Some people, to save money, fill a bucket with bottled water and just dip their plants in the bucket, running the water through. BAD IDEA!! It is like passing a bucket of water around a room of stranger and having everyone drink from and spit in the bucket. We could get very sick! An orchid with pests, bacteria, fungus, or virus, could infect our whole collection that way. Therefore, if you use bottled water, just run it through the plants and don't save what comes out.

We can water straight from a hose with a filter on it from Arizona Mist Systems. Eileen and Alex say that this does a good job of eliminating calcium from the water. I have never used it.

We can use a reverse-osmosis system which has the water cross a membrane that removes the calcium. Talk to a water system dealer like Culligan or Rayne about putting one in your growing area. The downside is that the initial installation can cost you $1000 or more, and you must change the filter every year, which can cost $100's. There is no extra cost every month, however. I did speak to Clarice, and she said she bought hers for only hundreds of dollars and changes the membranes herself for only a few dollars, so if you are clever, it might not be that much it seems.

I use de-ionized water, which has been passed through a resin filter full of hydrogen and combines the hydrogen with the carbonates to precipitate out the calcium and magnesium. **Peggy Heinz of US Filter has made us a special offer to install the resin tank for free, saving us at least $100. Free is good. Call her directly at 1-480-797-9914 and tell her you are from the club. The US Filter number, in case you don't reach her, is 1-800-235-7739**. Then, you rent the tank for $15 a month, and pay $75 every time they come and remove the spent tank, which can last from 6 weeks to several months. For me, this was the cheapest way to go since there was a small upfront cost and now NO upfront cost. I love my de-ionized water, which has virtually no particles and is just pure water. My root tips (that is, my ORCHID root tips) are firm and white with green tips. It is just great! (AND US Filter doesn't give me any kickback for saying these nice things. I just like it...) Remember, when you have R/O or de-ionized water, you will need to add some minerals back in since you have removed them all. You will need to pick a fertilizer with a little calcium in it from time to time.
It is really a matter of poor, better, best. City water is poor. Sodium-softened water is deadly. Potassium-softened water is better, and R/O, de-ionized, or bottled water is best. Rain would be nice, but that is another story!

In Las Vegas, it is difficult to overwater since it is so dry. Most of us use plastic pots since they retain more water around the plant. Remember to water your orchid THOROUGHLY each time you water. If possible, take the plant to the sink

or bathtub and pour plenty of water over it. This thorough soaking will flush out any salts from the water or fertilizer that has built up. The established wisdom is to water your plants in the morning so that the water will evaporate before it gets cool. Build up humidity around your plants by grouping them together, having them sit on wet pebble trays just above the water. Don't sit the plants in water as this will rot the roots. A notable exception is the genus Phragmipedium which grows sitting in water and likes to sit in a little water.
Invest in a mister, a great item from Hydrofarm that sprays fine particles of water (www.hydrofarm.com) and can be purchased with a hydrostat which turns it on and off automatically when you reach a certain humidity. If you can't afford the $400 for one, buy a room-size humidifier from a place like Sears to pump up the humidity. Evaporative coolers have the advantage of cooling and adding humidity and are fine additions to your growing area. You can install an overhead mister like the ones used in restaurant for little cost, or you can spray your plants with a hose daily to get the humidity up to the 50-70% considered ideal.

How often to water your plants? It depends... We did a little demonstration in the club showing that different potting materials retained different amounts of water and therefore needed to be watered differently. From three quarts of water, sphagnum moss retained 7 ounces, while coconut husk and diatomite retained 4 ounces. Bark and perlite retained 2 ounces, while styrofoam and tree fern fiber retained nothing. You would need to water a plant in the moss much less than one in the bark. As the bark ages, however, it will break down, the air spaces will shrink, making it retain more water. Newly potted orchids have to be watered more often than those that have been potted months ago. In fact, eventually, the medium gets so compact that it retains TOO much water, leaving no air spaces, and therefore, old medium should be discarded, and the plant should be repotted. Read about your particular plant. Some plants like Cycnoches and some dedrobium go dormant in the winter and shouldn't be watered at all.

Most of us water one or two times a week. If you pot in diatomite, you can water every day since they say that the water just runs through after it has absorbed what it can. I spray my plants every morning in warm weather, just the equivalent of a little morning shower on the leaves. It cools me off, and, I suppose, the orchids, too. Before you water the pot, lift the plant and see how much it weighs. If you lift pots after watering and before watering, you will see after a while when you plant needs water by the pot weight.

Orchids with pseudobulbs like cattleyas like to get a little dry between watering. If your youngest pseudobulb on your catt is nice and plump, you are doing a good job. Older pseudobulbs can shrink a little. A pseudobulb is like a camel's hump and carries an extra supply of water for emergencies, but if a plant has no pseudobulb (like a paphiopedilum or a phalaenopsis), don't let it dry out completely between waterings.

How to water? You will see below that everyone does it differently. Alan Koch of Gold Country Orchids believes you should get the leaves all wet and them feed the LEAVES (and only occasionally the roots) with a fertilizer like Sea Weed Extract. Others says to water the medium and not the leaves. (What's a body to do...)

I e-mailed members of the club and asked if members would share how they water their plants. What a lot of different ways we do it! When we care for plants, we are often all alone, and "taking a peek" into how the rest of us do it, I think may be helpful. Thanks to the considerate souls who have shared with us.

GAIL HARRIS WRITES:
So **that's** why I've been killing all those plants.....You have to **water** them???

Joking aside, I water my indoor plants, usually on Saturday or Sunday morning, at the sink using regular tap water (lukewarm) to flow through the pot to saturate the mix and flush out the salts, then the next day, I pour through fertilizer (mixed with the same tap water -- but, this time, it's been sitting out for a day to let the chlorine dissipate). The plants (cymbidiums) that live outside under the eaves of a north facing patio cover, get watered with a hose and our occasional rains. They are watered more often since they withstand the heat and higher light -- a bit of sunshine in the early morning. Ever since a guest speaker told us about dendrobiums putting out flower spikes after being sprinkled with rain in their natural habitat, I put mine outdoors with the cymbidiums and sprinkled them with the hose as well. Guess what? For the first time, they've bloomed!

As for humidity, I still have an evaporative cooling system in my house. In the summertime, when it's going 24/7, the hydrometer reads about 60 to 70% humidity. In the winter, both the plants and I enjoy the humidifier, but 40 to 50% is about all we achieve. All the orchid pots are set inside another pot on a layer of lava rocks that are kept moist to raise the humidity around the plant. All

the rooms in my house, including the outdoor patio, have ceiling fans and they are never turned off. The weather now is between needing the evaporative cooler and the heater and humidifier, so it's a bit drier than usual; however, my home is surrounded by huge trees, so the air here is more humid than in the rest of the neighborhood.

When I attended the Technology Fair that the Water Authority hosted in September, I got some information about a reverse osmosis system that returns the excess water into the hot water cycle of the house, rather than dumping it into the sewer system. Seems worth looking into; although it does cut down on the water district's return flow credits, it would sure save on our water bills!

Hope this helps. I don't have a greenhouse yet, so I have had to make do with whatever comes to mind. Not the best environment, but it's all I can do for now.

DIANA SMITH WRITES:
As you know, I have a reverse osmosis system for most of my watering. I got it from Ultra Pure Water Systems in CA (www.a1ultrapure.com) for around $300. It's a 5-stage system for 20 gallons per day. As I use it, this is quite sufficient, although I do want to buy a larger storage tank because 3 gallons is just barely enough to spray all my hanging plants. I may replace it sometime, since it is fairly wasteful. I have a 30 gallon container that I fill every week and use when I need lots of water.

Anyway, I water mounted and basket plants daily in the winter, and many of them twice a day in the summer. My potted phals, paphs, some coelogynes and other species are watered three times a week in the summer and twice a week in the winter. If we are in a rainy or humid spell, I may hold off an extra day. Most potted plants are watered once per week, summer and winter. I do this on Sunday, and it is also the watering that I add fertilizer. Some of my species need an extremely dry spell during the winter, so these I hang, mark with a label, and avoid during my weekly water "show". I do see where some plants should not be watered every week on Sunday, but with over 170 plants and only 20 minutes to spare in the morning during the week, I can't get more complicated than I already am! Generally, I pot using media that will take a "fer sure" watering once a week no matter how large the pot or how cloudy and cold it gets.

I use RO water for the daily watering of mounted and basket plants. During the summer I may use our well water on those days I have some potted plants to do also. Our water was tested at around 300 mg/L total dissolved solids. I also use it to thoroughly flush out all the pots on Sunday before I use the RO/fertilizer solution. Since our well water storage tank is outside and can get cold during the winter, I can't use straight well water November through March. I have to do it all with RO water mixed with just a bit of well water to add minerals. Once a month, I water without fertilizer to flush the pots.

I use well water for my mist system, also. I did buy an anti-clog filter (some sort of phosphorus-based thing from Arizona Mist Systems) that keeps the mist nozzles from becoming too crusted. The mist system is attached to a humidistat, which I love! I don't have to worry about changing timers to match outside weather conditions. I have it set at 45%, which is truly the minimum that my greenhouse gets. The system also helps keep the temperature down during extremely hot weather. It is a system, by the way, that I just cobbled together using mist tubing, nozzles, and a solenoid plugged into the humidistat at a total of $75. Because it uses well water, I have it pointed at the floor rather than the plants or it would leave a mineral buildup on leaves.

I really would like to have access to unlimited water with <100 ppm dissolved solids. Then I would pot in a medium-sized inorganic mix and water with a hose everyday, hooking into a Hozon-type automatic fertilizing system feeding minute amounts whenever I want.

You have seen my greenhouse plants. I use colored tags to indicate plants that need to stay moist and those that need drier conditions. They definitely make things easier to know which plants need watering more often.

EILEEN MCKYTON WRITES:
In the new house we will be using tap water with a calcium inhibitor filter. We water once a week with weak fertilizer, however we will have a misting system set with an automatic humidistat. The area is 27 x 27 but will have a 10 x 20 pool in the middle. The orchids will surround the pool and this should also help keep up the humidity. We also have a fogger if there is any area that might need it. There will be ceiling fans for circulation. We will see what needs to be adjusted once we move into the house when it is complete.

ANNE MURPHY WRITES:
I use filtered tap water and don't pay much attention to the tempurature, it is usually not to cool. I keep the fertilized water in a gallon jug that I pour on after I have watered. I don repour the runoff of water through the same plant only. I water at the sink and wet the plants leaves then, I don't have any good way of misting except at the sink because the plants are in stands on a wood floor. (any suggestions). I do have trays or larger pots that the plants sit in so the water can evaporate around the plant and receive some extra moisture that way. Humidity is whatever my house is.

LILLIAN PATTERSON WRITES:
I only have dendrobiums in the house and water when dry every 3 days or so. I have a water softener with Potassium Chloride that seems to work okay. I have them by a bright sunny window on the west side that doesn't get too hot because I have houses and trees that block the direct sun.

The clay pot thing that Clarice said to do works quite well so far..... I applied some grapeseed oil lightly to the leaves to wipe the water spots off them, they seem to be okay.

I got that big clay pot dendrobium from the silent auction table that last Sunday and it is blooming some beautiful white flowers. I love it and have just the spot for it.

MIKE LEVIN WRITES:
I use deionized water spraying it heavily on the plants and the media they are in. I add miracle-grow through a miracle grow feeder placed just before the sprayer anywhere from 1 to 3 times a month. My phrags, masdevallias and miltoniopsis sit in this pure water most of the time and occasionally I will put recently repotted paphs in the water as well to try to keep the fresh media moist. I dont really like any of my plants to dry out completely, ever, however some will from time to time and it is probably fine for cattleyas.

CLARICE DEAN WRITES:
Watering the orchids can be simple or complicated; it all depends on time. When I'm short on time it's as easy as getting out the hose and giving every pot a splash or two. However, when I have plenty of time, I pamper the plants with some extra attention that they respond to by growing and blooming well!

I have two plant areas where I maintain different plants with different needs and different watering setups. For instance, my *Phalaenopsis* are cultured under lights in my garage. They are watered from the house water which is softened with potassium chloride which is a substitute for sodium chloride. Sodium chloride will KILL plants, potassium chloride will NOT. Plants can actually use some of the potassium in the softened water as a mineral resource; however, the medium still can build up alkaloid salts. To help slow down the accumulation of salts, I do three things: I leach the pots with lots and lots of water very frequently, I top dress the medium with coconut coir and make sure the medium NEVER dries out completely. I mention these three things because maintaining these requirements has a great deal to do with how I water.

In a perfect world it would be my intention to leach the plants well at every watering. So even with that in mind, I'm lucky if the job gets done once a month! Of course, by leaching I mean to run enough water though the pots at one time to wash the salt accumulations out of the bottom. The best way to do this is to water the plants as you normally would, then about an hour later go back and water thoroughly making sure that plenty of water washes though. The first watering serves to dissolve excess salts and the second washes them away.

Top dressing the medium is related to watering because I use coconut coir; which is a very fine medium that washes though the pot after several waterings. I use as much material as it takes to completely cover the existing medium. The coir also helps the plants stay moister longer. Additionally, with my phalaenopsis potting method, the salts actually accumulate on the coir which is on the top of the potting medium where the pot dries out first. That fact leads me to the reason why I never allow the medium to dry out completely.

You see, salts cannot accumulate until the medium dries out. And since the top portion of medium always dries out first, that is where the salts will be most apparent. I use a fairly coarse medium for *Phalaenopsis*, so each time I water, a portion of the salt that accumulates on the coir is washed out the bottom of the pot. (I learned about salt accumulation from Bob Gordon. His *Phalaenopsis* book is in the club library.)

In addition to watering with water softened with potassium chloride, I also maintain a small RO unit in the phalaenopsis area. This is the common type that

has a three gallon pressurized tank. I use the RO water to supplement my normal watering. In addition, all fertilizer is mixed with RO water.

I fertilize with $\frac{1}{4}$ to $\frac{1}{2}$ strength Growth More 20-20-20. When I think of it, I occasionally use a blossom booster. And, of course, in the fall I water the *Phalaenopsis* with Epsom salts - 1 Tbsp. per gallon - just because many experts say this treatment will promote flowering. (I have no idea if it works.) When the plants are growing strongly, I like to fertilize at every watering. I mix the fertilizer in a garden sprayer, and then each pot is sprayed lightly with fertilizer after the pots have been thoroughly watered. I then water again with RO water to wash the fertilizer down into the pots. I also believe that this top watering helps wash some of the salts down as well. (After all, fertilizer is a salt too.) The RO tank is fitted with long tubing and a hand sprayer just like those found on typical garden sprayers - like a Hudson sprayer.

Typically, in the summer my *Phalaenopsis* need watering two to three times a week. In winter, depending on the weather, I water as infrequently as once every 10 days. This watering method works for me and my plants. I know this sounds complicated and time consuming, but actually, it's very therapeutic for me.

DAN MUMAU WRITES:
I use tap water but the tap water we use is run through a softener which uses Potassium chloride. The water softener and R/O unit is manufactured by Rainsoft and cost about $7,000.00. I also use the time release fertilizer pellets as well. It seems to work.

JANE GREEN WRITES:
I use bottled distilled water on plants that demonstrate they are too sensitive to being watered with Arrowhead spring water. I water Thurs. and Sun during the summer. Some get water almost every day -- paphs, phrags, miltonia -- some phals - depends on what medium they're in.

In the winter, I pay attention to how all seem to be doing but generally cut back to once a week.

I also trot my phals outside to a sheltered area in hopes of making them happy with the temp. difference to encourage blooming.

If I'd take a break from buying MORE orchids, I could probably get an RO system. But acquiring new plants ever beguiles!

Re: humidity. Most are in larger pots that can hold water below the plant's pot. The ones "in waiting" to bloom are in my southern -facing master bathroom tub on stainless steel shelves with big trays of water below. Most have drip pans, saucers, whatever to provide individual supplies of evaporating water.

I have a small fan to breeze them with but don't manage this often as I don't want to leave the house with the fan running.

Water temp. is room temp.

Misting: no. Read it only makes the orchid fanatic feel better - not the plants.

The orchids on display in the rest of the house have fair lighting and - again, are in larger pots so that they have water evaporating from below.

I just discovered that the workbench in the garage has fluorescent work lights over it. I need to figure out what size grow- lights might fit and then I'd have yet another growing area...and one that I could control with timers.

Insidious...insanity..but I know you understand.

CAROL SIEGEL WRITES:
I grow in an enclosed area in my garage on light cart. I have a sink that is attached to my US Filter de-ionized water tank. I also have a spraying wand attached to the tank. Every five days, I take all of my hundreds of plants to the sink and water them thoroughly. I count to five three times for each plant (Doug Conklin said to do this...) Because I have deionized water, I fertilize weakly (half-strength) most of the time, but every fourth watering I just use water. Since I heard Alan Koch speak, I try to spray the leaves with water and then pour my mixed-up fertilizer over the leaves a couple of times for every time I just fertilize the roots. I use Jungle Green (from www.orchidweb.com) or Sea Weed Extract or whatever I have and alternate something else in it- a few drops of CMS, iron, or Superthrive. Sometimes, when desperate, I use Bloom Formula fertilizer in the vain hope that that will make a difference. (CMS from Hydrofarm helps with blooms, too) In the morning in the summer, I spray my

leaves lightly with my watering wand to refresh and cool. I spray the mounted orchids every day when I am home. This takes a lot of time. I am retired. Also, I like to handle my plants, and I can see the first mealy bug, scale or mite because I actually look at each plant. When I go on vacation, Jane Green, kind soul, (255-3648) waters my plants.

JUNE CRAVENN WRITES:

First of all my plants are in an enclosed atrium with the top open with a screen over it, so the area is subject to the elements. I figure that if a plant lives and flowers again that it is a miracle. At this point in my life since I work many,many hours and then travel some, I don't have time to be dealing with a lot of the things everyone talks about. I lost a lot a my plants when it froze around new years and I was in Maui. I enjoy them when I buy them and if they bloom again I say "thank you God" and some of them do.

Tell me how you water your plants. What kind of water do you use (tap, bottled, r/o, deionized, other). **I use regular tap water.**

If you use reverse osmosis or deionized, where did you purchase your unit and how much did it cost (if you want to share that).**n/a**

How often do you water? **Every couple of days in hot weather.**

How do you water (hose, by hand, at sink, automatic, etc)? **Hose for the most part**

Do you water everything the same way and as often? **yes**

Do you mist in addition? **No, although I do have a water cooler fan and other regular fan that I use in hot weather when I am home. If I am traveling, I don't leave them on.**

Do you water the same in the summer as in the winter? **Winter I water less, perhaps just once a week**

How long do you water for? **I just stick the hose in the plant and let is run maybe 10 to 30 seconds depending on the size of the pot and plant..**How long does it take you? **10 minutes or so for all of them** Do you pay attention to the temperature of your water? **No.** Do any of your plants

stand in water? **no** Where does the water drain? **the area has dirt underneath and then rock and has a drain**

How do you provide humidity? **just from the watering and the water draining down to the rock.**If you have a mister, what kind and how much did it cost? **n/a** (If you want to share that...) What humidity do you think you provide for your plants? **I have no idea** How do you know? **don't know**

You don't have to answer it in that order, but I thought it would stimulate you to think about your watering. It would be really nice if we had someone ELSE'S opinion on things besides mine since others have greater and different knowledge from mine. Love ya, Carol

CHRISTINE DE LA CRUZ WRITES:
Several months ago, I ordered a small hobby greenhouse, 8-1/2 x 8-1/2 feet, with a shade cover, from Rion Greenhouse which my son and I assembled together.

I took your suggestion and ordered deionized water from US Filter, the cost was around $500.00 plus, including the 6-month rental of the tank. I also got a small swamp cooler and thermostat from Nevada Cooler Pad for around $300 plus that my son and I installed ourselves. I have three sets of shelving where my 90 plus orchids sit and they seem pretty content. I got the shelving at Organized Living and they're great because the water just drains into the gravel floor (which Daniel Vong recommended) which helps to cool the plants.

Since I've been using deionized water, my plants have been showing a lot of new growth and my cattleyas, phals and the denbrobiums that we got free at our meetings have also been blooming. I water once a week, and if it has been particularly hot, I check to see if some of the plants need additional watering. I also apply (or try to remember to apply) fertilizer after watering but sometimes I forget. But I think they do get fed at least once a month. Maybe if I fed them more, they would bloom more!

I've had the deionized water since the end of May, but so far, I

haven't had to replace the tank yet. So that's 4 months. I believe it's another $75.00 for replacement, but only when you need it. I use a small coil hose and it only takes me about 10-15 minutes to water. On Saturdays, around 9:00-10:00 a.m. (when I get up from a late night playing the penny machines) the water temp is just right. The swamp cooler set at 75-85 degrees (the thermostat isn't that accurate-only $16.00 --I will have to buy a better one) gives out enough humidity per the hygrometer which registers around 60-80 and when I mist, it goes up to 100. The light meter registers around 9000 which is kind of high but it's cool enough so the plants don't get burned.

Besides the shade cover that I ordered with the greenhouse, I also put another shade cloth (Home Depot) under it because it was too bright. It also helps to insulate the area from the heat and cold in the winter. When the plants were in the kitchen previously, I used this shade cloth to cover the windows to let light in but not burn the plants.

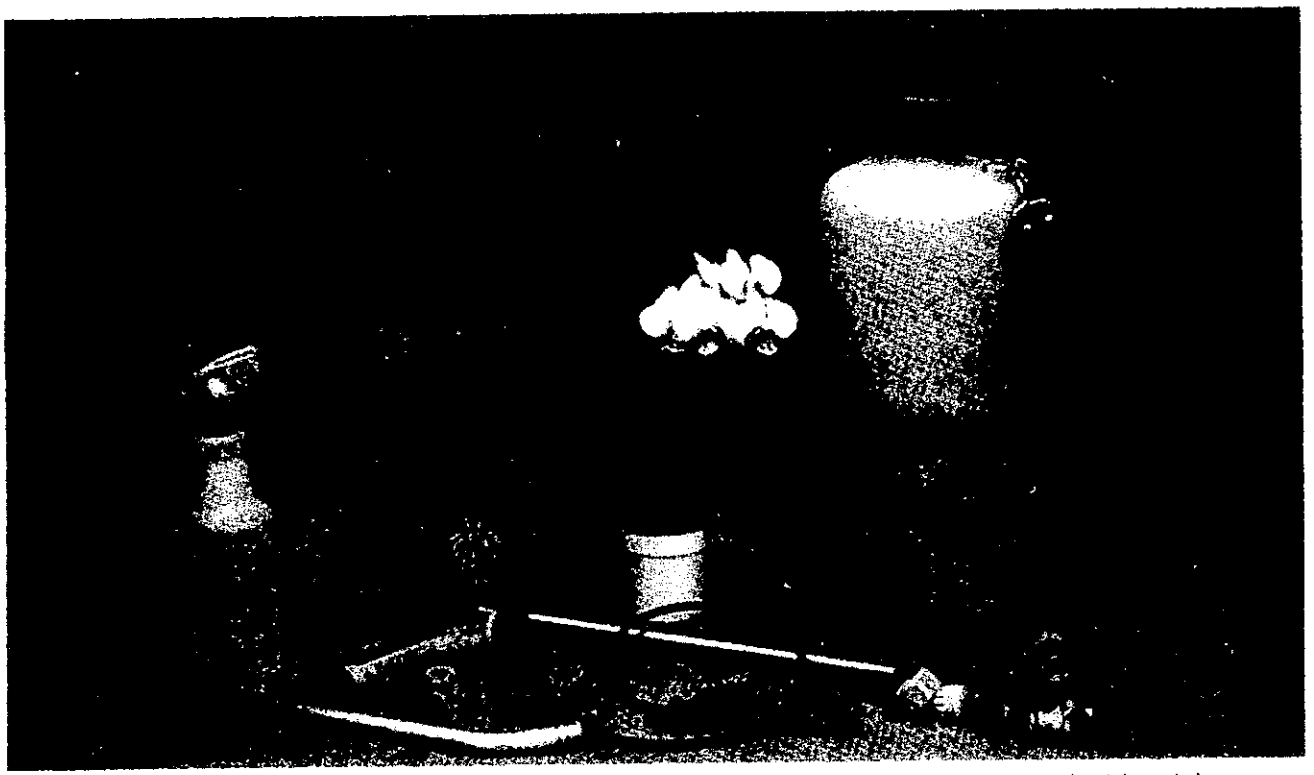
I got a thermometer w/ remote (Home Depot) that shows the temp in the greenhouse from the kitchen which is also helpful. It shows the highest temp reached and the current temp and you don't have to go out to the greenhouse to check.

My problem now is the heating. I haven't figured out yet what I'm going to need this winter and will ask the experts (Carol, Clarice, Mike) for advice at our next meeting.

Christine

Confessions of an Overwaterer[2]

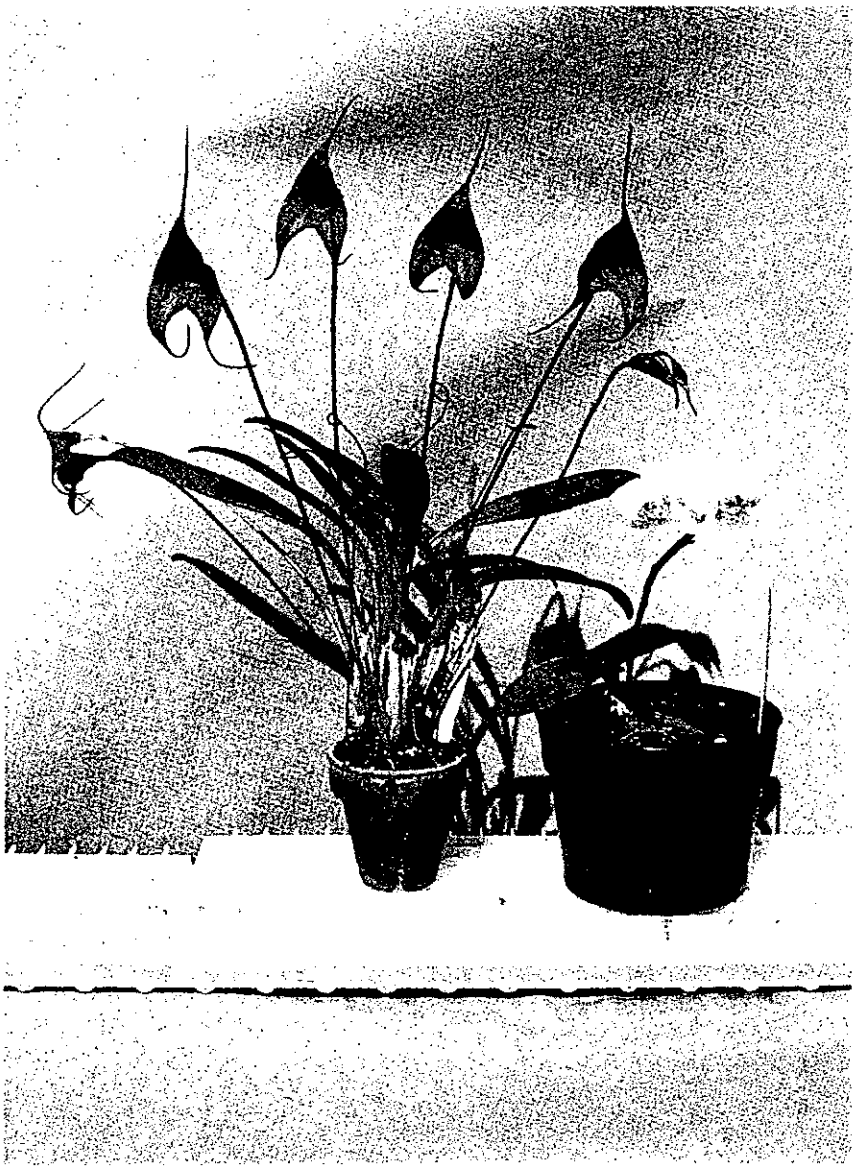
Watering can be a difficult thing to judge when it comes to orchids, especially when you are just beginning to grow them. Actually, *everything* seems to be a difficult thing to judge when you are just starting out. But watering is an incredibly critical factor, right up there with how much light to give the plants. If you can get those two things right, or at least not half-bad, you're probably going to get orchids to bloom, regardless of whether you figure out fertilizing, potting media, hybridizing and all the rest of the confusing mass of things they tell you about in books.



From left to right, *a hand sprayer, 3 gallon Spray Doc tank sprayer, garden water wand with quick connect fittings, Dramm water breaker, Hozon proportionator, Fogg-It Nozzle, and on/off hose valve are some of the tools available to make watering easier.*

Of course, all those other things are important, but frankly, mastering those "finer" aspects means you will increase the quality

[1]37 Oakwood Crescent, Union, New Jersey 07083.



Masd. ***Kimballiana 'Elizabeth', AM/AOS*** *and* **Phal.** ***Be Glad*** *have been placed on top of an egg crate over a water tray to help raise the humidity.*

and quantity of the blooms. Mastering water and light, on the other hand, pretty much guarantees the orchid will bloom in the first place, which is all most of us are after when we're just starting out. So in this part of the "stuff-they-never-tell-you" series, we'll tackle watering our potted plant and fertilizing it as well, since that goes easily hand in hand with watering.

Water is so important to plants in general because it's not only vital for photosynthesis, but it also carries all the nutrients around so they can be absorbed and used, and maintains the pressure, or turgor, necessary to keep the plant upright. It is in every cell of the plant, constituting 90% of its fresh weight. Water is taken up primarily by orchid roots, which have root hairs and a white, sponge-like "velamen" around them, all of which help in storage and absorption.

THE HORROR OF OVER WATERING

It is virtually impossible for orchids growing naturally on trees to get too much water, since there is no place for water to stand around and rot the roots. In fact, orchids have even developed many types of water-storage organs (thick leaves, velamen-covered roots, fleshy pseudobulbs) to survive the times when water drops below ideal levels. Most orchids live where the environment goes through periodic drought. They are far better equipped to resist being dry than they are to being waterlogged. But in the home or greenhouse, where we have stuck orchids in pots, we subject them to the very real danger of overwatering. You will kill more orchids by overwatering than by any other method. I guarantee it. I've killed my own share that way.

Overwatering does not happen by wa-

tering thoroughly at one time. Watering thoroughly, so that the pot gets thoroughly soaked, is actually ideal, as long as the potting medium is well-drained enough that the water will run through quickly. Overwatering results when you water too frequently, rather than too thoroughly. If you water too often, too much water sits around in the pot, taking up the space where air would otherwise be. Orchids want to dry out a bit between waterings; most have enough stored water to function well in between.

The danger of overwatering is not actually that the water itself is toxic. The danger is that there is not enough oxygen around the roots, which causes tremendous damage. Roots take in oxygen in order to convert the stored sugars made by photosynthesis to a usable energy form, in a process called "respiration," which is sort of the opposite of photosynthesis. Respiration not only needs oxygen, taken in by the roots, but also produces carbon dioxide, which is released through the leaves and roots. Not enough oxygen around the roots combined with all this carbon dioxide that can't be carried away means (yes, folks) ROOT ROT. And rotted roots eventually mean a dead plant.

If you've overwatered by watering too often, the plant will let you know by the leaves turning yellow and shriveling —the plant is starving because the stored sugars aren't being released. Beginners tend to panic at this sight and think that the shriveling means there's not enough water, so they compound the error by pouring on more water. If you look at the roots, however, rot will reveal itself in the form of mushy brown or black roots, which tell you to stop watering until the plant can dry out. Another problem that goes along with overwatering is that an organic potting mix will break down much more quickly when there is too much water, compounding the problem by retaining even more water around the roots. Orchidists with a heavy hand in watering can adjust their mix to accommodate the tendency; coarse bark, tree fern, lava rock, stone culture all serve beginners well to compensate for overwatering. Clay pots also help.

Another problem with too much water arises from overhead applications of water. Watering so that the leaves get soaked with water can lead to several problems. Water can stand in the crown of plants such as phalaenopsis or in the new, softer growths or leaves of many plants, which can cause rot and possible death of the plant. Watering from above can also lead to the deposit of calcium, magnesium or iron deposits on the foliage (see "The Quality of Water"). If the collection is not so large that it becomes too difficult, try to water orchids directly on the potting mix rather than at the leaves. Another solution is to keep the pots that tend to collect water in their crowns slightly tipped forward to allow water to run off. This is actually how the plant would grow in nature.

An overwatered plant can be rescued if discovered in time; if the mix is badly deteriorated, repot, often into something coarser, then allow the plant time to recover. If there are no viable roots left, there's real difficulty in saving the plant. The rotted parts will have to be cut off, and the plant may regenerate new roots if given lots of humidity rather than lots of water; a clear plastic sweater box with moist sphagnum moss in the bottom might be a good place to put such a damaged plant for a few weeks until roots appear. Plants that have had their roots destroyed prefer to be misted rather than watered.

Underwatering can have its problems too, usually far less severe than those of overwatering, but nevertheless problems. There are two kinds of underwatering. The worst is by just sprinkling the top of the mix and not applying enough water at once and letting it drain through. Please don't do this to your orchids. Besides not giving the plants enough water, the failure to allow water to drain through means that the inevitable salts in the water will settle in around the roots, clinging to the mix, which can be ultimately

toxic to the plants. This is especially critical if you are adding fertilizer to the water, which contains even more salts. Letting water drain fully and thoroughly through the pot on a regular basis allows salts and other impurities to be "leached" out of the pot — a beneficial flushing process. The second way of underwatering is by watering correctly but not often enough. Most people don't do this, but when it happens, roots shrivel and turn gray and brittle. Keep an eye on the roots to see whether you are watering correctly; you can always fine-tune potting mix by adding more water-retentive materials (sphagnum moss, finer bark, etc.) if you tend to water only very infrequently. Plastic pots are also an aid to the infrequent waterer, for they hold twice as much water as clay ones will. Some plants will quickly tell you when you've underwatered; new leaves of miltonias, for example, will crinkle in an accordion fashion.

WATER TEMPERATURE

Temperature of the water is also important. Much research has shown that cold water, below 50 degrees F, can damage roots and also cause cell collapse on leaves if splashed on top, particularly leaves of phalaenopsis. Cold roots don't take up water and nutrients very well. Room-temperature water works well. If you are using a hose in a greenhouse where there is no hot water to temper it, let the water stand in a barrel for at least 24 hours to bring it to air temperature. (Letting water stand also allows a lot of the chlorine from tap water to evaporate.) In cold weather, try to water as early in the day as possible, to help the leaves dry and the rootball to get back to ambient temperatures before the cold damp night can bring fungal and bacterial disease. Whether air temperatures are cold or not, it is almost always best to water early in the day for those same reasons. Avoid watering plants when the sun's rays are hottest, particularly plants spending the summer outside or in a bright greenhouse, because droplets left on leaves can actually focus the sun like a magnifying glass, burning the plants.

THE "QUALITY" OF WATER

Many ask about the "quality" of water to be used for watering orchids. In general, most tap water is fine to use. In point of fact, many years ago, Dr. Wesley Davidson at Rutgers University found that orchids may grow better when they receive water with small amounts of dissolved salts in it, such as found from the tap, than by using rainwater.

Problems with tap water can arise when the water is too "hard," which means it has salt in it, usually calcium, sometimes also magnesium. Hard water is not necessarily bad for orchids because calcium and magnesium are beneficial elements, although some types of orchids are particularly sensitive to salts; these tend to be finely rooted and thin-leaved ones.

Davidson defined water as too hard if it had more than 100 parts per million of calcium carbonate or its equivalent. Hard water can cause problems if used for watering orchids overhead, rather than applying it directly to the potting mix, because deposits of calcium or magnesium carbonate can be left on the leaves, causing a whitish residue that is very tough to remove. Not only does the residue look bad, it can cut down the light penetration to the chlorophyll within the leaves, resulting in a reduction of photosynthesis and food production, eventually weakening the plant. Too much iron in tap water can affect plants in exactly the same way, leaving rusty brown marks on the leaves. These components in the water can eventually clog most sprayers. Tap water often also has a lot of chlorine and fluoride. Water quality can be tested by local water-conditioning companies or by the municipal water supply. (Some areas of the country have high boron levels; if so, switch to another source of irrigation water.) The best test for salts in water is one that tests the electrical conductivity of the water; pure water doesn't conduct electricity well, but

one with a lot of salts will. For those so inclined to battle with meters and such, instructions for a home water test were given in "An Instant Water-suitability Test" by Bell and Stimmell in the March 1990 *AOS Bulletin*.

The pH of water also makes some difference to the orchid plant. Generally, the water pH can range from 4.0 to 7.5, although many growers have used water with pH as high as 9.0, which is very alkaline. (A pH of 7.0 is neutral; anything below 7.0 is acidic, anything above it is alkaline. Each drop or rise of 1 means a tenfold increase or decrease in acidity or alkalinity; a pH of 5.0 is 100 times more acid than a neutral pH of 7.0.) Most orchids grow where it is somewhat acid, probably in the 5.0-6.0 range. Even rainwater is not neutral. It is actually acidic, usually with a pH around 5.6 because carbon dioxide in the atmosphere combines with falling water to form a weak carbonic acid. Nowadays due to "acid rain," which combines rain with airborne pollutants from our industrialized regions, rainfall in many parts of our country has a pH much lower than normal, between pH 4.0 and 5.0. Extremes of pH (below 4.0, above 7.5) are best avoided because some plant nutrients then become unavailable to the plant, often precipitating out as solids or binding with something else rather than staying in solution where the roots can absorb them.

Ways to improve the quality of tap water include switching to rain water via collection in cisterns or rain barrels (see *AOS Bulletin*, April 1989 for an article by Schweitzer, Pitel and Schweitzer on collection of rainwater) or else manipulating the water in some way to remove the salts. However, NEVER, EVER use water that has been "softened." Standard water softeners in the home simply use a process that takes out the calcium and magnesium ions and replaces them with sodium, a salt far more toxic to plants than the original ones. A far better method of removing them is by "deionization," a technique that demineralizes by substituting the ions with something harmless. One example is a "weak acid," ion-exchange resin water softener, which takes the hard water, passes it through a resin full of hydrogen and lets the hydrogen combine with the carbonates to precipitate out the calcium and magnesium. The resulting hydrogen carbonate (weak carbonic acid) then naturally breaks down into carbon dioxide and water. Another method is something called "reverse osmosis," which tends to be more costly but which can remove up to 97% of minerals under conditions that can't be improved by other methods. Talk to your local water-conditioning companies to decide if water conditioning is needed and what options you may have. There is also a new device that purifies water by filtration and solar-generated pasteurization, which can be built at low cost with local labor, using readily available materials (write Pax World Foundation, 4400 East West Highway, Suite 130, Bethesda, Maryland 20814).

Rainwater, which normally contains very low levels of mineral salts, becomes a viable alternative for many people, who swear by the good results. However, in using rainwater, be aware that you may run into possible deficiencies of calcium, magnesium and iron, even if you are fertilizing, for most fertilizers don't contain calcium or magnesium (manufacturers assume the water supply will contain sufficient amounts). One way around this is to water with tap water every fourth watering or so, or to mix some tap water with the rainwater. Watch where you gather rainwater; in very polluted areas it may not be suitable, and there have been cases of roof collections where the galvanized steel roof combined with the acid rain to extract a lot of heavy metals (zinc, cadmium, lead) which ended up in the orchids, deadly stuff.

WATER IN THE AIR

Humidity and watering, by the way, are two entirely different things. Relative humidity is the water-vapor content of the air expressed as a percentage of the amount

With such a variety of fertilizers on the market, figuring out which is the best to use is not always an easy task.

it is capable of holding at the same temperature; watering relates only to the amount of water being held in the pot around the roots. In general, orchids prefer an environment that is holding 50% relative humidity. They'll grow with far less (many dry winter houses barely reach 20%, making hair stand on end when you walk across a carpet), but blooms and growth will be much better if relative humidity is in the 50-70% range. Home hygrometers, which measure humidity, are widely available.

Air can be made more humid by using a humidifier around the plants. The ultrasonic types emit a finer mist that stays in the air longer and can be bought with a cartridge to filter out salt deposits. Try to get one that holds at least five gallons so you're not constantly having to fill it. Another method is by misting the air around the plants several times a day with a fine mister/sprayer. Even easier is by standing the plants over trays of water. NEVER stand the pots directly in water, however, or roots will rot. Often the advice is to use "pebble trays," trays of stones that are filled with water and the pots stand on top of the stones, but I find this a bit inconvenient; the pots tend to wobble due to uneven stones.

Better still is to buy "egg crate." If you've got an image in your head of something in which to package baby chickens, dismiss this immediately. It's actually used as panel covering in dropped ceilings over fluorescent light fixtures. Where it's even more useful is in an orchid collection, placed over trays of standing water with the orchids on top, instead of having to balance pots on top of rocks. Egg crate resembles a rigid plastic lattice work, found in hardware stores for about $8 a panel for a 2' x 4' piece, but sometimes you can negotiate to buy the broken panels they're stuck with for as little as $2. You can cut to size by snipping at each lattice joint with wire cutters (laborious but worth it).

WATERING AIDS

Other equipment that proves handy in watering orchids includes the various types of nozzles on the market that attach to hoses for fine spraying, which help in watering plants without so much pressure that the potting mix is constantly floating out of the pot. Fogg-It makes a number of nice ones that range from superfine to heavy volume (1/2 gallon water per minute up to 4 gallons per minute). Watering wands that extend your reach are also great, as are adapters that fasten to the kitchen faucet and allow a hose to be attached. A tank sprayer is another must; they come in various sizes that

can be pumped up by hand to deliver a nice spray or stream, depending on the nozzle, often with a strap for lugging it around easily.

I have virtually everything that looked like it might be suitable to support orchid pots. But nothing worked as well as I wanted until someone gave me a plant tray from one of the under-lights setups available on the market. Made of fiberglass, about 2' x 4', they have drainage holes in them with plugs, which makes life infinitely easier when you can water pots in place without having to take them to the sink. Tubes can be easily attached to the drainage hole, leading to a bucket. It can be tipped slightly at one end to help direct water out to the hole. As an added bonus, egg crate tucks inside the tray so you can leave water standing under the pots.

In a greenhouse, get the hose up off the floor and hang it from wires located near the greenhouse roof. Besides not having to trip over the hose anymore, making this simple change will help to prevent accumulation of disease organisms and allow easy movement of the hose over long distances without constantly knocking over pots. If you don't want to make your own from parts available at hardware stores, a kit is sold by Hi-Hose, 70 119th Street, Watervliet, New York 12189.

FIGURING OUT FERTILIZING

Once you've spent some time paying attention to watering, inevitably the beginning grower gets thrown into the fertilizing frenzies. As with watering, more orchids are probably overfertilized than underfertilized. There is no question that properly fertilized orchids will put out more lavish growth and blooms. The trick is in finding the right level of fertilizer at the right times. By and large, fertilizer applied at very low rates, much lower than usually recommended on fertilizer labels and given at regular intervals, will help your plants more than not fertilizing. But a heavy hand at fertilizing, especially at odd intervals, is worse than not fertilizing orchids at all. Because of their ability to store water (and thus also the nutrients carried up by water), orchids tend to need less feeding than other plants.

WHAT DO ORCHIDS NEED?

There are nine major nutrients needed by orchids (and all other plants, as well). The most important by weight are hydrogen, carbon and oxygen, which come from the air and water, and they comprise more than 90% of the plant. The next six are known as "macronutrients," and of these six, three are needed in large enough amounts to warrant that fertilizers are based on them. These primary three are nitrogen, phosphorus and potassium (N, P, K, respectively). The other three macronutrients are calcium (Ca), sulfur (S) and magnesium (Mg), usually needed in amounts less than those N-P-K. Another seven mineral elements have been found to be necessary to plants, which used to be called "trace" elements, or minor elements, because they are needed in exceedingly small amounts. They are now technically called "micronutrients" because the terms "trace" and "minor" seemed to mitigate their importance too much. These seven are iron (Fe), manganese (Mn), zinc (Zn), copper (Cu), boron (B), molybdenum (Mo) and chlorine (Cl). This means, in total, 16 nutrients have been found to be vitally needed in plants.

DECIPHERING FERTILIZER LABELS

Nitrogen, phosphorus and potassium (N-P-K) are so important that it is their ratio, expressed in percentages, that are the numbers you read on fertilizer labels. (If you are constantly forgetting whether P stands for phosphorus or potassium, remember that they always go in alphabetical order — phosphorus comes before potassium. The K for potassium comes from the German word for potassium, *Kalium*.) A formula of 18-18-18 means there is 18% nitrogen, 18% phosphorus, and 18% potassium available in that fertilizer. A formula of 30-10-10 means there is 30% available nitrogen to

only 10% each of phosphorus and potassium. A formula of 3-1-1 is the same ratio as the 30-10-10, but a fertilizer with that formula only contains 3% available nitrogen and 1% each of phosphorus and potassium. Formulas with such low numbers mean that you have to use more of them to get the same effect as a higher and thus more concentrated formula with the same ratio. All commercial fertilizers contain a legally determined amount of filler, inert materials that help ensure even distribution. Many also contain a harmless dye to help you gauge fertilizer strength once dissolved in water.

When you buy a fertilizer that is termed "complete," it does not necessarily mean it contains all the micronutrients or even all the macronutrients. All they mean by "complete" is that it has significant amounts of nitrogen, phosphorus and potassium. Most of the other nutrients are not included in fertilizer because basically they are made available to orchids via other ordinary sources, such as from tap water, and also via the breakdown of organic potting mixes, which release micronutrients in the process.

When you hear the term "balanced," this also only refers to N-P-K and not to any of the other nutrients; "balanced" means that the amounts of the three must be roughly equal, or at least that one number is not more than twice any of the others. Unless they are potted in bark, orchids generally prefer a "balanced" formula of N-P-K; common formulas on the market include 18-18-18 and 20-20-20. If bark is the medium, generally 30-10-10 or 20-10-10 is used (see "Understanding N-P-K" for more on bark fertilizing).

Another term often touted on fertilizer labels is the word "safe," which does not refer to people or pets or the environment. "Safe" in this case means that the fertilizer is not very soluble, so the risk of "burning" the plant is low. It is also not necessary to use a fertilizer that specifically says "Orchids" on it; any general fertilizer with a ratio close to 10-10-10 or 20-20-20 or 30-10-10 is fine. The difference in the ones specially formulated for orchids is that you can actually use the stuff at the rates recommended on the label, although, frankly, you're still better off underestimating the dosage. For all other types, use no more than half the recommended doses, preferably even a quarter strength. Remember, orchids need far less fertilizer than other plants.

Normally, the reason you are using fertilizers is simply to make sure the plant is receiving sufficient amounts of nitrogen, phosphorus and potassium. Unless you are using rainwater and/or an inorganic potting mix that does not break down, you generally do not have to worry about adding the other macro- and micronutrients, for they will generally be made available to the plants through water and the organic mix. Using an inorganic mix will approximate growing orchids "hydroponically," especially if you also use rainwater, which is usually devoid of minerals, and you will have to use a fertilizer that contains everything. A good article about hydroponic culture in general and application of fertilizer can be found in the December 1989 *AOS Bulletin*, "Growing Orchids in Rockwool," by Wally Thomas. If you do add lots of micronutrients when not really necessary, you run the risk of severe root damage due to salt buildups. The necessary elements are only useful to plants when they are available in the "right" soluble forms, and they often can precipitate out as salt forms, becoming unavailable and potentially harmful.

KILLING WITH "KINDNESS"

The really important part about orchid fertilizing is not to apply too strong a dose. Dilute the fertilizer in room-temperature water, using less than the directions call for, and mix it thoroughly to make sure all the salts are dissolved and won't end up as clumps on orchid roots, which cause damage. Never apply fertilizer to a dry plant; water it first, then apply the fertilizer solution. As a beginner, don't use fertilizers that you apply dry to the plant, because unless

you are really adept at watering, the amount being dissolved can be erratic and not beneficial. Use the types that come as solids and have to be dissolved; they usually have more available nutrients in them than the liquid types.

Orchids also prefer very weak solutions frequently rather than higher doses less often. This means it's usually best for the plant to be fertilized every week, every time you water. To help flush out any possible accumulated salts, once a month just water with plain water without fertilizing; this process is known as "leaching." Too much fertilizer in general will show up often as "burned" leaf tips, tips that turn brown or black.

UNDERSTANDING N-P-K

Why are nitrogen, phosphorus and potassium so important to the plant? To start with, nitrogen is an integral component of cell chemistry — amino acids, nucleic acids, chlorophyll— and is the nutrient exhausted soonest. An application of nitrogen is more quickly evident in plant development than any other essential food element. Too much nitrogen makes the plant produce too much green growth, particularly at the expense of flowers, a terrible affliction indeed when it comes to orchids. Large applications make the plant tissues "tender" and weak, abnormally dark-leaved and less resistant to disease, weather stress and pests. Too much nitrogen often leads to massive insect infestations feasting on the soft, tender, tasty growths. A deficiency, on the other hand, causes the older leaves to turn pale green to yellow as the nitrogen in them is transferred out and given to the newer leaves, and new growth is often smaller. A good balance of nitrogen is therefore essential.

Orchids potted in bark have been found to need more nitrogen than when potted in other mixes because the breakdown of this organic mix by the common wood-rotting fungus requires more nitrogen to feed the fungus, which otherwise robs the plant of nitrogen. This is why orchids in bark are usually fed a high-nitrogen 30-10-10 formula. More and more growers, however, are starting to recommend using only 20-10-10 instead, finding it sufficient to satisfy the fungus. Many are beginning to think that the 30-10-10 makes the plant grow too "soft" because of excessive nitrogen.

The source of nitrogen in a fertilizer has been getting a lot of attention lately. Most plants get their nitrogen in the form of nitrate (NO_3^-) or ammonium (NH_4^+) ions, and most plants want both forms, although the nitrate is the predominant form absorbed by plants. Recent advice suggests using fertilizers that derive nitrogen directly from nitrate rather than urea forms, since urea has more potential to "burn" plants. (Be aware that all nitrogen products give off acids as they're converted to usable, soluble forms of the nutrient and have the potential for "burning" plant tissue. This is a main reason not to overfertilize.) Most commercial fertilizers use urea, a synthetic organic compound, as the greatest source of nitrogen, since it is easy to make, yielding high amounts of nitrogen at low cost. Urea, however, must be broken down in more steps before arriving at a nitrate form, and the losses of nitrogen can be high. Recent studies at the University of Massachusetts have shown that when five different sources of nitrogen were used, more nitrogen retention and biggest plant growth occurred using ammonium nitrate (also tested were ammonium sulfate, calcium nitrate, urea and Osmocote (tm)). The researchers also tested in another study potassium nitrate, calcium nitrate and urea as the sources of nitrogen, and of those three, found better growth with potassium nitrate, with urea last. Urea-fertilized plants even showed signs of potassium deficiency, which suggested that the calcium and ammonium ions in the urea may interfere with potassium absorption, resulting in unbalanced nutrition of plants fertilized with it.

Phosphorus is always found in abundance in young, fast-growing tissue. It is

needed in plants to ripen tissues and ripen seed, vital in energy-transfer systems and healthy roots. More often you will see a deficiency rather than an overabundance, first seen in older leaves as phosphorus is moved to the newer leaves. Older leaves lose their sheen, and a pigment shows through the chlorophyll, usually along main veins on the undersides, and the plant matures slowly or fails altogether. The pH of the water and potting material can make a difference to availability of phosphorus; at very low pH (2-5), it can precipitate out of solution. At pH between 7 and 10, it becomes its most available.

Potassium is vitally important in plant enzymes, which means it plays important roles in regulating rates of photosynthesis, respiration and metabolism, enormously essential for young growing parts. It is also important in disease resistance and general vigor and provides the balance between the growth factor of nitrogen and potassium. Deficiences also show up first in older leaves, since potassium is moved to newer ones when supply is low. Chlorophyll will start to leach out of the leaves (chlorosis), older leaves will be scorched at the margins and root systems will be very poorly developed.

THE BATTLE OF ORGANIC VERSUS INORGANIC

A particularly scintillating controversy in the fertilizer world involves using "organic" fertilizer versus "inorganic." The basic difference between them is that organic fertilizers have to be broken down by bacterial processes in order to be in a form that can be utilized by the plant. This means that organic fertilizers are very slow-release sources of nutrients, which, of course, can be very beneficial to orchids. Inorganic sources, on the other hand, are very readily and almost immediately available to the plant, which can also be beneficial — nutrients often show up in a plant's system within an hour or less. There are loyal groups on either side of this controversy; try both types to determine your own preferences.

Organic sources do tend to be more expensive than inorganic ones, and they encourage the more rapid breakdown of organic potting mixes due to the increased bacteria needed to break down the fertilizer. On the other hand, studies at Cornell University have associated significantly smaller pest/insect populations with the use or organic fertilizers compared to those on plants fertilized with highly soluble (inorganic) N-P-K materials or left unfertilized, and the plants were healthier and better able to withstand stress — certainly food for thought. The most popular organic fertilizer for orchids is fish emulsion, a liquefied fish byproduct that smells awful, with a formula usually around 5-1-1.

A famous organic fertilizer is made from steeping aged cow manure in water and using the diluted resulting "tea" to fertilize orchids. Lu Tempera, who has been awarded the AOS's Butterworth Trophy for best culture, is a devotee of this method, which produces what is known in the Northeast region as "Lu's Brew." He takes the equivalent of 20 tablespoons of a 4-4-2 manure and places it in one gallon of water, shakes it up, then allows it to sit for 24 hours. Then the "tea" (not the residue) is poured into a five-gallon bucket, and enough water is added to fill. He then uses the bucket with a proportionator, which dilutes it further to 1:16, and waters his plants with this. (In winter, he also uses a 6-7-10 commercial fertilizer and never uses blossom booster). If results are to be believed, this method is justly heralded (although surely we can't discount the enormous amount of time and attention Lu also pours into his plants every day, a decided factor in his success.) "Teas" are not a robust fertilizer; they're more like a general tonic.

TIMING, TIMING, TIMING (AGAIN)

To make things infinitely easy, you can always simply fertilize your orchids every time you water, with quarter-strength fertilizer in a ratio around 20-20-20 (or 20-10-10

if in bark), watering with plain water once a month to flush out the salts. But if you want to get more sophisticated about when and what to fertilize, realize that orchids at rest (not doing any growing) don't need fertilizer, so when you notice the lead growth is mature, don't water or fertilize until you see new growths or inflorescences. Orchids need fertilizer, particularly nitrogen, most from the time they begin new growth until that growth is about 2/3 complete. Then, as the plant goes into a slower phase of growth, it should receive a formula with less nitrogen, or even no fertilizer. As flower spikes and buds start to form, you can switch to a formula high in phosphorus and potassium to encourage flowering; this is known as a "blossom-booster" formula, usually 10-30-20. As another note, avoid using a high-nitrogen fertilizer on small seedlings, because the growth tends to be too fast, yielding a weaker plant. And stay away from fertilizing plants that look sickly.

The vast majority of fertilizer should be applied directly to the potting material in solution rather than sprayed on the leaves. "Foliar" feeding is mostly used to provide micronutrients, although it is a bit controversial. Results have been somewhat variable in sprays of macronutrients, but it has been shown that phosphorus at least is readily absorbed by leaves.

To help the procedure of fertilizing, buy a proportionator that hooks right to the hose at the spigot. Then a stock solution of fertilizer can be made in a bucket, attached to the proportionator and released slowly and evenly in a dilute fashion as you water. The Hyponex and Hozon proportionators are inexpensive and dilute to around a 1:16 ratio; others range from 1:50 to 1:128, for more money and more accuracy. This allows you to feed easily every time you water, with less chance of overfertilizing. (Disconnect the proportionator once a month to allow just plain water to leach out the medium.) After you turn on a proportionator, don't start watering until you start to see the fertilizer dye color.

If you're overwhelmed by all this water and fertilizing "help," don't fret; use the "Quick Guide to Watering" to weed through it all. And just remember to feed "weakly, weekly," as the AOS *Handbook on Orchid Culture* reminds us.

Next month, we'll attack light and temperature and where to put all these pots that seem to accumulate in such an alarming fashion, particularly in the late winter/early spring flush of orchid shows, in "Why on Earth Won't It Bloom?"

A QUICK GUIDE TO WATERING

How do you know how much to water your orchids? It's frustrating to ask questions like that of inexperienced orchid growers, because the answer you invariably get is, "It all depends on your own individual growing conditions," which makes you want to punch the know-it-alls right in their masdevallias. Of course, they're right, which makes the answer even more insufferable, especially when all you're looking for is some sort of rule of thumb to help guide you down the dark, bewildering, hazardous orchid-growing path. So here are 10 basic rules for watering orchids:

1. Orchids can get by with a lot less water — and a lot less fertilizer — than you think. They're made that way, most of them, with all sorts of water-storing pseudobulbs, fleshy leaves and thick roots that evolved in conjunction with periods of drought in nature. You will probably kill more orchids by overwatering than anything else. So as a rule of thumb, plants with the thickest roots, most succulent leaves and the fattest pseudobulbs need the least water of all. Those with finer roots, thin leaves and no pseudobulbs will need more water.
2. Orchids usually grow on trees or on rocks and attach their roots to the surface of whatever they're growing on. This means when it rains, water runs off freely and quickly past their roots and leaves. Therefore, as a rule of thumb, orchids like to

be drenched with water that will run quickly through the pot. They don't like light applications of water. They like soaking, as long as it runs off fast. Bring pots to the sink and run them under the faucet for a few minutes. Don't just moisten the top of the medium every day.

3. On the other hand, orchids that don't normally grow on trees but grow more in the ground (such as paphiopedilums, cymbidiums and phragmipediums) like to be a bit wetter than those that grow on trees. This does not mean they will like light applications of water. This means simply they want a slightly more dense medium in which to grow, which will hold the water a little longer than an open medium of, say, plain bark or stone. So, as a rule of thumb, water all your orchids the same way — soaking them thoroughly. The difference in the amount of water they need will be adjusted by watering a bit more frequently, not in the way you apply the water, which remains the same for them all.
4. Because they can go for long times without water, orchids have gotten used to drying out a bit. Some of them are more camel-like than others. Cattleyas, for instance, are two-humped dromedaries, while the much more finely rooted and thin-leaved miltonias are downright thirsty little devils. One of the best rules of thumb is an old and tired adage, but it works well. To see if an individual plant needs watering, stick your finger (or a dry, thin stick) about an inch down into the medium, near the center. The goal is to catch the mix just as it's beginning to dry out. If it's wet, don't water. If it's dry, water. And when in doubt, don't water.
5. Orchids in big pots don't need to be watered as often as orchids in little pots. To make life easier, try putting pots of similar size together, since they will often dry out at the same time if the mix is the same composition and age. Watering is also made easier as you generally use the same type of mix for most of your plants.
6. Orchids in clay pots will need to be watered more than the same orchid in a plastic pot, probably twice as often. Clay pots breathe and lose water out the porous surfaces.
7. Orchids in brighter light will need more water and more fertilizer than orchids in dim light, basically because they will be growing faster. Orchids will also need water more often on sunny days than cloudy ones.
8. Orchids that are fertilized regularly will need more water than orchids that never see a Peters canister. Always use half to one quarter the strength of fertilizer recommended on the label. Resist the temptation that makes you think if a little is good, a lot is better, because you will end up sending overfertilized plants to that great Orchid Society in the Sky. And don't fret too much about fertilizing, because I confess I went for years never adding fertilizer to my bark-potted plants and still got orchids to grow and bloom.
9. Orchids in high temperatures need more water than orchids in lower temperatures.
10. If you are still totally bewildered by watering and still can't figure out what to do, then use the most basic and simplistic rules of all: Water plants in two-inch pots every three days. Water plants in four-inch pots every five days. Water plants in six-inch pots every week. And if even that's too hard, water them all once a week. The ones that die are too sissy for your collection anyway. ♦

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